[0022] According to a third aspect of the invention there is provided a method for determining which one of a plurality of sensing areas in a sensing region of a touch-sensitive user interface is selected by a pointing object, the method comprising: measuring a coupling (e.g. a capacitive coupling or a magnetic coupling) between the pointing object and respective ones of the sensing areas and generating output signals responsive thereto; and determining one of the sensing areas to be the selected sensing area by taking account both the output signals associated with the sensing areas and the positions of the sensing areas within the sensing region.

[0023] The method may further comprise outputting an output signal indicative of the sensing area determined to be the selected sensing area.

[0024] Other aspects and features of the invention are as follows.

[0025] One aspect of the invention is that it may provide a method of removing keying ambiguity by measuring a detected signal associated with each key in an array, comparing the measured signals, determining that an upper key having a signal in relation to a lower key signal is the unique user-selected key, and maintaining that selection until either the upper key's signal strength drops below some threshold level or a second key's signal strength exceeds the upper key's signal strength. When an upper key and a lower key are pressed by a user, the upper key is preferentially selected and its signal strength value may be enhanced relative to the other key(s) so as to deselect the other key(s). In this aspect, the array under consideration may be a keyboard, or any convenient subset thereof.

[0026] The present invention provides an improvement over U.S. Pat. No. 6,466,036 and U.S. application Ser. No. 11/279,402 (published as US 2006-0192690 A1) in that an upper key of a keypad can be preferentially selected over a lower key or keys even if the signal from the upper key is weaker than the signal from the lower key or keys. This is particularly advantageous for small keyboards or keypads, like mobile phones which are becoming increasingly smaller in size with improvements in technology and due to consumer demand requiring ever more miniature and 'slim' handsets. With small mobile handsets the keys can be spaced very closely together which means that it is difficult to press the intended keys, especially if the user has large fingers. Often a user may accidentally press more than one key at the same time including the intended key the user wished to select. The invention allows an upper key to be selected by suppressing the signal from other adjacent keys that may also have been pressed or from which capacitive coupling may have been detected, as the upper key is often the intended key of the user.

[0027] The invention may be used in combination with the teaching of U.S. Ser. No. 11/279,402 (published as US 2006-0192690 A1), although when it is recognised that there is a signal associated with an upper key and a signal associated with a lower key on a keypad, the upper key may be preferentially selected over the lower key. Therefore, the present invention may be referred to as 'position-dependent' key ambiguity reduction and this may override the detection integrator counter (DI) system disclosed in U.S. Ser. No. 11/279,402 (published as US 2006-0192690 A1) when touch from a group of keys is capacitively detected and there is an upper/lower key relationship between the keys.

[0028] U.S. Ser. No. 11/279,402 (published as US 2006-0192690 A1) discloses an embodiment with an array of capacitive keys in which each key has a respective detection integrator counter (DI) associated with it. Each DI is a clocked counter that counts up by one incremental value on each capacitive acquisition cycle during which a signal strength from the associated key is above some nominal threshold value, and that counts down toward zero if the signal strength is less than the nominal value. A controller receives a respective input from each DI and determines that one of the keys is selected, e.g., wins, when the detection integration (DI) count associated with that key meets a respectively selected terminal count value, TC. The incremental magnitude used for counting down can be the same as that for counting up, e.g., 1, or it can be different, e.g., 2, to preferentially accelerate the count-down 'losing' process over the winning process, in order to facilitate better suppression of noise. The rate of counting down any of the DI counters can also be the complete value, i.e., the DI can be cleared in one cycle. In this embodiment, when two or more keys have signal strengths above their nominal thresholds, the key with the lesser signal strength will have its associated DI decremented or cleared each cycle while this condition exists. If any two or more keys have equal and maximal signal strengths, such keys' DI's will continue to increment until the first to reach its TC 'wins' and is set as the unique user-selected key.

[0029] In another embodiment, the DI of a key selected at a first instant may be decremented or cleared and that key deselected even if the signal strength of that key is above the threshold value and its DI equals its associated TC value, if second key becomes selected at a later instant by virtue of its signal strength being greater than the signal strength of the first key while also being above its own threshold value and having its associated DI equal its associated TC. If there are multiple keys with signal strengths above their associated threshold values, their associated DIs will count up and down in competition, until one key's DI finally equals its TC and wins over all others including over the previously selected key.

[0030] In the above discussions, it should be understood that the principle of having one signal greater than another has been somewhat simplified for explanatory purposes. In order to avoid indecisiveness and eliminate oscillation between two or more keys having more or less the same signal strengths, the winning key may preferably be given a slight advantage in subsequent repetitions of the decision process. This may be done, for example, by requiring a non-selected key's signal to exceed the currently selected key's signal by a small amount. This can be done by subtracting a small amount off the signals of non-selected keys, or by adding a small amount onto the selected key's signal.

[0031] In an embodiment, if the signal strengths of two keys that are approaching a detection threshold value and that are both in a defined keyboard neighborhood both exceed the threshold value and their signal strengths are equal to each other (or are within a selected tolerance value) at the same time, an algorithm executed by a controller may be used to declare one of the two keys to be active and the other to be inactive. It will be recognized that a wide variety of algorithms are possible and include, but are not limited to, a random, or pseudo-random selection of the active key, or